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TISD File

STATINTL

[redacted]

December 14, 1960

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STATINTL Subject: [redacted] Proposal PC-60-30, "Extension of
STATINTL Comprehensive Photogrammetric Computing System"

Dear [redacted] STATINTL

On January 20, 1960, [redacted] contracted with your organization to produce a comprehensive photogrammetric computing system. The current contract expires January 19, 1961. Initially, fourteen computer programming problems were specified, and the total contract amount (less fixed fee) was [redacted] which was based upon a total of 6510 man-hours to be expended. It was mutually agreed that the priority and anticipated scope of the specified tasks could be altered to meet exigencies arising within your organization, and that additional problems could be added as the need arose. It now seems appropriate to consider the extension of time and funds required to continue the development of this system. STATINTL

ACCOMPLISHMENTS UNDER CURRENT PROGRAM

The anticipated status of each of the original fourteen problems by the middle of January 1961 is described in the following paragraphs.

1. Height determination from stereo comparator measurements. This problem was combined with Problem 6, described below, and the final program will determine the height from either or both methods, and output the individual values together with the weighted mean. The entire program and the report will be completed by the end of the current contract.

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2. Orientation determination from horizon exposures. A universal approach to this problem was taken in order to provide a solution applicable to any number of photographs in any operational mode. Analysis of this had been completed and flow charting initiated, when the requirements were modified by your technical representative in mid-November. The revised analysis and flow charting necessitated by this change will be completed by mid-January, but the programming and report will not.

3. Computation of settings for [redacted] STATINTL rectifier. This program had been completed and the report prepared. Then in November the manufacturer made design changes which necessitated a change from fixed lens formulas to movable lens formulas. The revised program and report will be completed by mid-January.

4. Control program for [redacted] electronic rectifier. STATINTL This program will produce control tapes for panoramic or frame type rectification. The program and report will be completed by mid-January.

5. Least squares adjustment of lines in space. This program and report have been completed.

6. Height determination from shadows. This problem was combined with Problem 1. The program and report will be completed by mid-January.

7. Shadow factor for each mission. This program has been completed and the report will be issued this month.

8. Control extension of special photographs. The output of Problem 2 will be used as input to determine the orientations of the photographs. These orientations will then be enforced in the triangulation. The control extension program for standard photographs, Problem 9, will be flexible enough to accept this condition. Therefore Problems 8 and 9 will be combined from this point on. The analysis has been completed and flow charting will be in progress for both problems by mid-January, but the detailed programming and the report will not be started.

9. Control extension of standard photographs. This has been combined with Problem 8 as described above.

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10. Terrestrial photography. The analysis and flow charting for this problem will be completed by mid-January but detailed programming will not.

11. Solutions of spherical triangles. This program has been completed and the report has been issued.

12. Camera calibration. Two procedures were specified for this problem. The analysis of the problem will be completed by mid-January, but flow charts, programming, and report will not.

13. Transformation from photograph to perspective rendition. The analysis of this problem was carried to the point of defining the input parameters which it would be necessary to specify. Your technical representative decided that the specification of these inputs would be too difficult to make this problem worth pursuing at this time.

14. Investigation of new computer requirements. At your request the scope of this problem was considerably enlarged. We prepared a separate proposal, PA-60-9, to cover this additional work, but in accordance with your direction, the task was funded from the present contract. Approximately [redacted] were expended upon it. The task has been completed and the report issued.

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During the course of the current contract three additional tasks have been added to the original statement of work. The anticipated status of these tasks at mid-January is described in the following paragraphs.

15. Evaluation of the effect of SAMOS photography on the operation of your organization. The scope of this task has not yet been completely defined, but it is anticipated that approximately ten man-months of effort will be required. This will be approximately half completed by mid-January.

16. Programming for Recomp II. An orientation program developed under a preceding contract was reprogrammed for the Recomp II. Approximately [redacted] were expended upon this problem, and approximately the same amount of funds were added to the original contract total. This task has been completed and the report issued.

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17. Revision of horizon program. We are reconstituting the flow diagram for this program, checking the coding, and examining the convergence criteria. The revised programs will be completed by mid-January.

SUGGESTED WORK FOR CONTRACT EXTENSION

The work required to complete tasks assigned under the current statement of work has been indicated in the preceding section.

During the prosecution of the present tasks, a number of additional problems have become apparent. These are described in the following paragraphs.

1. Examine the library of photogrammetric computing programs to determine whether improvements, changes or additions would be appropriate in one or more of the following areas:

a. Standardization of orientation systems, axis systems, nomenclature, etc.

b. Calculation of error functions and development of programs to evaluate these functions. The probable errors of the output quantities will be determined as functions of the probable errors of the inputs. Also, the number of significant figures in output quantities will be determined. These error computations would be written as optional routines for the particular programs involved.

c. Changing the storage locations for constants and subroutines to make programs externally compatible. This would permit "hookup" routines to be written so that the input of an appropriate key word would cause several related programs to be run in a desired sequence.

d. Changing the order of computation and thus reducing computational errors.

2. Develop a program to correct input coordinate measurements. The required corrections are:

a. Averaging of several measurements

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b. Reduction to principal point center

c. Film shrinkage

d. Camera lens distortion

e. Atmospheric refraction

f. Earth curvature (where appropriate)

3. Develop a program to convert from one set of orientation parameters to another. Both two and three element orientations would be considered as follows:

three parameters	tilt, swing, azimuth	two parameters	tilt, swing
	pitch, roll, yaw		pitch, roll
	φ, ω, κ,		φ, ω,
	3 element matrix		nadir point, horizon
			2 element matrix

4. Develop a program for direct and inverse transformations between UTM grid positions and latitude and longitude.

5. Develop a program to produce a special Laborde grid for use in photogrammetric control extension in any specified area of the world.

6. Extend the scope of the control extension programs to allow for weighting of control points and observations, and to permit the imposition of conditions arising from special qualifications of the vehicle; i.e., orbital restraints for satellite photography.

7. Develop programs for utilization of SAMOS photography. As the study of the impact of SAMOS proceeds, the need for numerous computing programs will become apparent.

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8. Prepare programs and conduct studies on additional problems specified by the client.

A detailed breakdown of the staff to be utilized and the estimated costs of the extension are given on the attached sheet. This proposal will remain in effect until January 31, 1961. If additional time is required, please contact Mr. [redacted] in our [redacted] office. For additional information of a technical nature please contact [redacted] in our Washington office.

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Yours truly,

[redacted]

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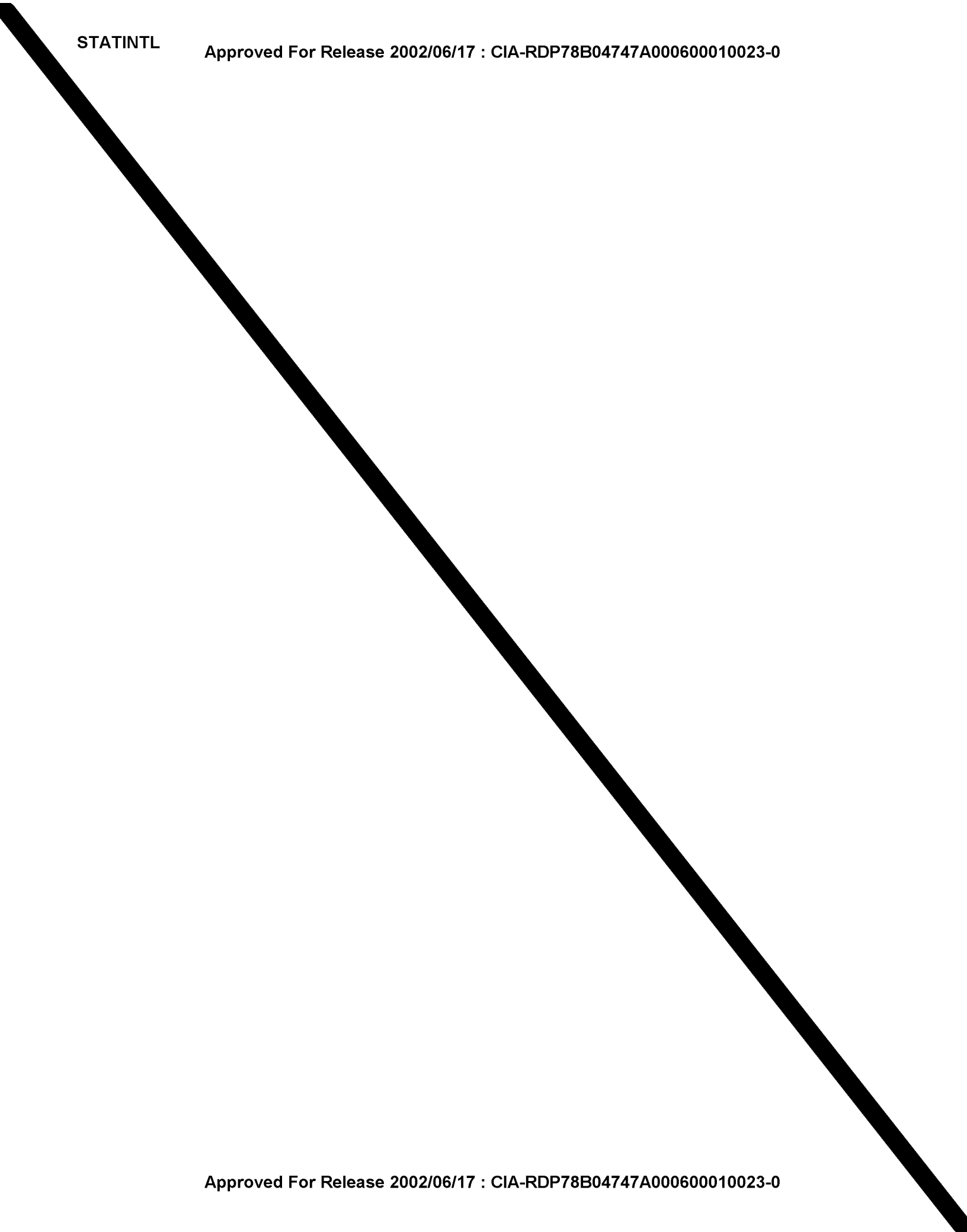
President

Enclosure



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